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U.S. Department of Justice
National Institute of Justice

Technology Assessment Program

NIJ Standard-0318.00

Physical Security of Sliding Glass Door Units

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Technology Assessment Program

NIJ Standard for

Physical Security of Sliding Glass Door Units

***A Voluntary National Standard Promulgated by the
National Institute of Justice.***

AUGUST 1980

U.S. DEPARTMENT OF JUSTICE

National Institute of Justice



**U.S. DEPARTMENT OF JUSTICE
National Institute of Justice**

Harry M. Bratt, Acting Director

ACKNOWLEDGMENTS

This standard was formulated by the Law Enforcement Standards Laboratory of the National Bureau of Standards under the direction of Jacob J. Diamond and Lawrence K. Eliason, successive Chiefs of LESL. The technical research was performed at the NBS Center for Building Technology under the supervision of Thomas W. Reichard.

NIJ STANDARD FOR THE PHYSICAL SECURITY OF SLIDING GLASS DOOR UNITS

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FOREWORD

Following a Congressional mandate* to develop new and improved techniques, systems, and equipment to strengthen law enforcement and criminal justice, the National Institute of Law Enforcement and Criminal Justice, now the National Institute of Justice (NIJ), established the Law Enforcement Standards Laboratory (LESL) at the National Bureau of Standards. LESL's function is to conduct research that will assist law enforcement and criminal justice agencies in the selection and procurement of quality equipment.

In response to priorities established by NIJ, LESL is: (1) Subjecting existing equipment to laboratory testing and evaluation and (2) conducting research leading to the development of several series of documents, including national voluntary equipment standards, user guides, and technical reports.

This document, NIJ-STD-0318.00, Physical Security of Sliding Glass Door Units, is a law enforcement equipment standard developed by LESL and approved and issued by NIJ. Additional standards as well as other documents are being issued under the LESL program in the areas of protective equipment, communications equipment, security systems, weapons, emergency equipment, investigative aids, vehicles and clothing.

This equipment standard is a technical document consisting of performance and other requirements together with a description of test methods. Equipment which can meet these requirements is of superior quality and is suited to the needs of law enforcement agencies. Purchasers can use the test methods described in this standard to determine firsthand whether a particular equipment item meets the requirements of the standard, or they may have the tests conducted on their behalf by a qualified testing laboratory. Law enforcement personnel may also reference this standard in purchase documents and require that any equipment offered for purchase meet its requirements and that this compliance be either guaranteed by the vendor or attested to by an independent testing laboratory.

The necessarily technical nature of this NIJ standard, and its special focus as a procurement aid, make it of limited use to those who seek general guidance concerning the physical security of sliding glass door units. The User Guide Series is designed to fill that need. We plan to issue guides to various items of law enforcement equipment as soon as possible, within the constraints of available funding and the overall NIJ program.

The user guides being issued are highly readable and tutorial in nature in contrast to the standards, which are highly technical and intended for laboratory use by technical personnel. The guides provide, in non-technical language, information for purchasing agents and other interested persons concerning the capabilities of equipment currently available. They may then select equipment appropriate to the performance required by their agency.

NIJ standards are subjected to continuing review.** Technical comments and recommended revisions are invited from all interested parties. Suggestions should be addressed to the Program Manager for Standards, National Institute of Justice, U.S. Department of Justice, Washington, DC 20531.

Lester D. Shubin
Program Manager for Standards
National Institute of Justice

*Section 402(b) of the Omnibus Crime Control and Safe Streets Act of 1968, as amended.

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NIJ STANDARD FOR THE PHYSICAL SECURITY OF SLIDING GLASS DOOR UNITS

1. PURPOSE AND SCOPE

The purpose of this document is to establish performance requirements and methods of test for the resistance to forced entry of sliding glass door units intended for use in residences. This standard addresses the capability of sliding glass door units to frustrate the "opportunity" crimes committed by unskilled and semi-skilled burglars. The rarely used methods of gaining entry through sliding glass door units, and those used only by skilled burglars, are not addressed.

2. CLASSIFICATION

For the purposes of this standard, sliding glass door units are classified by their relative resistance to forced entry into two classes, comprising Class I units that are designed to prevent entry by most unskilled burglars and Class II units that are designed to prevent entry by most semi-skilled burglars.

2.1 Class I

Sliding glass door units that provide a minimum level of physical security.

2.2 Class II

Sliding glass door units that provide a moderate level of physical security.

3. DEFINITIONS (See fig. 1)

3.1 Glazing

A transparent or translucent material which allows light to be transmitted.

3.2 Keeper

That part of a sliding glass door frame or fixed panel to which the latch interconnects to prevent the movement of an operative door panel. Also called a STRIKE.

3.3 Latch

That part of a door locking device which, when actuated, interconnects with the keeper to prevent the movement of an operative door panel.

3.4 Latch Operator

That part of a door locking device which is used to actuate the latch from the interior side of the door.

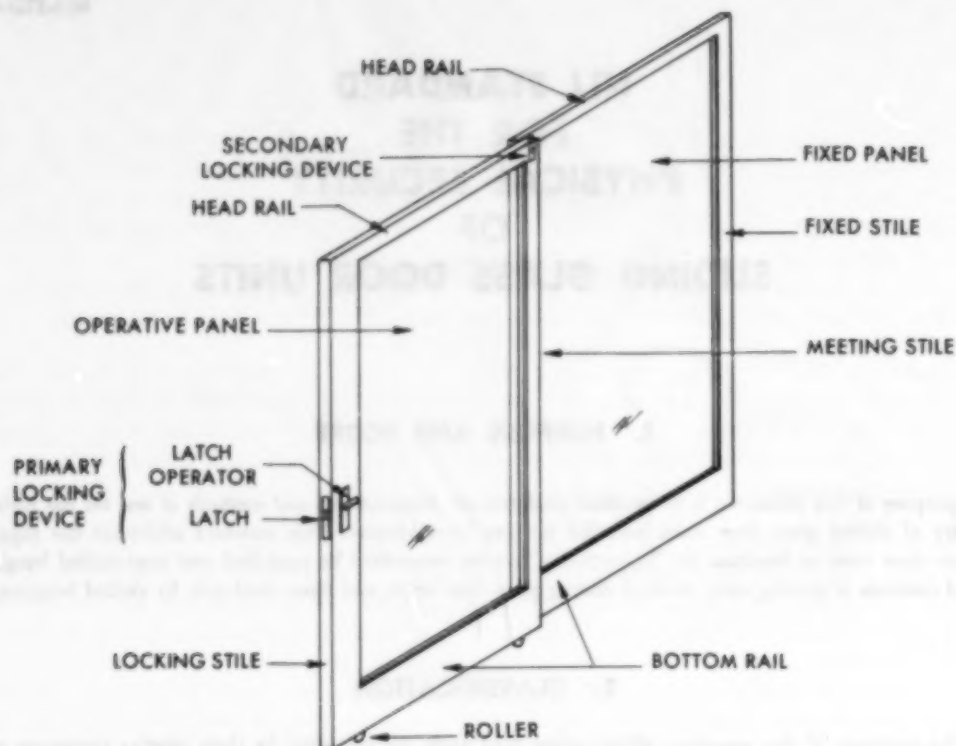


FIGURE 1. Sliding glass door nomenclature.

3.5 Locking Device

A device, sometimes keyed, which is installed on an operative door panel and consists of a latch operator and a latch. A primary locking device is one that is installed on, or in, the locking stile of the operative panel. A secondary locking device is one that is sometimes provided in addition to the primary locking device.

3.6 Loiding

A method of manipulating a locking device from the exterior of a sliding glass door unit by means of a thin, flat object or a thin stiff wire that is inserted between the locking stile and the keeper so as to force the locking device toward its unlocked position.

3.7 Panel

A component of a sliding glass door unit consisting of two vertical stiles and two horizontal rails surrounding and supporting the glazing material. An operative panel is one which is designed to be moveable, and a fixed panel is one which is designed to be permanently restrained from movement.

3.8 Patio Door—see SLIDING GLASS DOOR

3.9 Rail

A horizontal structural member of a panel.

3.10 Sliding Glass Door

One glazed panel, usually the operative panel, of a sliding glass door unit. Also called a PATIO DOOR.

3.11 Sliding Glass Door Frame

A component of a sliding glass door unit intended for installation in a prepared rough opening in a building and consisting of two vertical jamb members, a horizontal member at the top and a horizontal track at the bottom on which the operative panel rolls or slides.

3.12 Sliding Glass Door Unit

An assembly consisting of a frame, one or more operative panels that slide (roll) horizontally within the frame, and one or more fixed panels fastened to the frame and/or to the wall in which the frame is installed, and related hardware such as rollers and locking devices.

3.13 Stile

A vertical structural member of a panel. A fixed stile is the member of a fixed panel which is intended to be fastened to the frame or to some other stationary object. A meeting stile is one which mates with a stile of a companion panel when an operative panel is closed. A locking stile is the member of an operative panel to which a primary locking device is attached or installed.

3.14 Strike—see KEEPER

4. REQUIREMENTS

The sliding glass door unit requirements given below are summarized in table 1.

4.1 General Requirements

4.1.1 Classification

A sliding glass door unit meets the requirements for a specific security classification if the test specimen passes all of the required tests for that class.

TABLE 1. Summary of sliding glass door security requirements

Parameter	Requirements paragraph	Test method paragraph	Requirements	
			Class I unit	Class II unit
Disassembly	4.2	5.5	No entry	No entry
Latch operator loading resistance	4.3	5.7	45 N (10 lbf)	45 N (10 lbf)
Latch loading resistance	4.3	5.8	1335 N (300 lbf) plus weight of panel	2670 N (600 lbf) plus weight of panel
Locking device stability	4.4	5.9	Horizontal—222 N (50 lbf) Vertical—222 N (50 lbf) plus weight of panel (10 cycles)	Horizontal—222 N (50 lbf) Vertical—222 N (50 lbf) plus weight of panel (10 cycles)
Door panel removal resistance	4.5	5.10	Horizontal—445 N (100 lbf) Vertical—1335 N (300 lbf) plus weight of panel	Horizontal—445 N (100 lbf) Vertical—2670 N (600 lbf) plus weight of panel
Locking device strength	4.6	5.11	1335 N (300 lbf)	2670 N (600 lbf)
Fixed panel fastening strength	4.7	5.12	1335 N (300 lbf)	2670 N (600 lbf)
Meeting stile fastening strength	4.8	5.13	667 N (150 lbf)	1335 N (300 lbf)
Glazing impact strength	4.9	5.14	None	50 J (37 ft-lbf)

4.1.2 Failure Criteria

A sliding glass door unit shall fail a test if, at any time during or after the test, the tester can open it by hand from the outside by lifting, pushing, or pulling on it or by manipulating an exposed component; can enter through displaced or damaged portions, even though it might not be possible to move a panel; or if damage to a panel or glazing provides an unobstructed opening within which a rectangle 14 by 40 cm (5 1/2 by 15 3/4 in) or larger can be inscribed.

4.2 Resistance to Disassembly

The sliding glass door unit shall incorporate no screws, bolts, nails, staples, and/or other fasteners that are accessible from the exterior side, and whose removal in accordance with paragraph 5.5 would permit entry after partial or complete disassembly of the unit.

4.3 Resistance to Loiding

The sliding glass door unit shall be tested in accordance with paragraph 5.6 to determine whether or not it is possible to exert pressure on the latch operator and/or the latch in a direction that would tend to unlock the door.

If pressure can be exerted on the latch operator when the sliding glass door unit is tested in accordance with paragraph 5.6, the force required to disengage the latch and/or gain entry shall be not less than 45 newtons (N) [10 pounds-force (lbf)] when it is tested in accordance with paragraph 5.7.

If pressure can be exerted on the latch when the sliding glass door unit is tested in accordance with paragraph 5.6, the force required to disengage the latch and/or gain entry shall be not less than 1335 N (300 lbf) plus the weight of the panel for a Class I unit and 2670 N (600 lbf) plus the weight of the panel for a Class II unit, when it is tested in accordance with paragraph 5.8.

4.4 Locking Device Stability

When tested in accordance with paragraph 5.9, entry shall not be possible after each operative panel of the door unit has been subjected to ten loading cycles during which a vertical tensile load of 222 N (50 lbf) plus the weight of the panel is applied successively at each bottom corner while the panel is simultaneously subjected to a horizontal force of 222 N (50 lbf).

4.5 Door Panel Removal Resistance

When tested in accordance with paragraph 5.10, entry shall not be possible after each panel of the door unit has been subjected at each of the two specified points to horizontal and vertical forces, respectively, of 445 N (100 lbf) and 1335 N (300 lbf) plus the weight of the panel for a Class I unit, and of 445 N (100 lbf) and 2670 N (600 lbf) plus the weight of the panel for a Class II unit.

4.6 Locking Device Strength

When tested in accordance with paragraph 5.11, entry shall not be possible after the application to each of the three specified points of each locking stile of a force of 1335 N (300 lbf) for a Class I unit and of 2670 N (600 lbf) for a Class II unit.

4.7 Fixed Panel Fastening Strength

When tested in accordance with paragraph 5.12, entry shall not be possible after the application to each of the two specified points of each fixed panel of a force of 1335 N (300 lbf) for a Class I unit and of 2670 N (600 lbf) for a Class II unit.

4.8 Meeting Stile Fastening Strength

When tested in accordance with paragraph 5.13, each meeting stile shall remain connected to the rails after application of a force of 667 N (150 lbf) for a Class I unit and of 1335 N (300 lbf) for a Class II unit.

4.9 Glazing Impact Strength

When a Class II unit is tested in accordance with paragraph 5.14, entry shall not be possible after the application to the two specified points of each door panel of a single impact with an energy of 50 J (37 ft-lbf).

5. TEST METHODS

5.1 Test Sample

The test sample shall consist of a single sliding glass door unit, plus additional components as required to replace those that are destroyed during the testing. Installation instructions, and templates where necessary, for all hardware items that are to be installed in the field shall be included with each door unit.

5.2 Test Equipment

5.2.1 Low-Range Tensile Loading Device

The low-range tensile loading and force measuring device shall have a capacity of no less than 45 newtons (N) [10 pounds-force (lbf)] with a combined calibration and reading error no greater than 4.5 N (1.0 lbf).

5.2.2 Medium-Range Tensile Loading Device

The medium-range tensile loading and force measuring device shall have a capacity of no less than 667 N (150 lbf) with a combined calibration and reading error no greater than 9.0 N (2.0 lbf). Two of these devices are required.

5.2.3 High-Range Tensile Loading Device

The high-range tensile loading and force measuring device shall have a capacity of no less than 3335 N (750 lbf) with a combined calibration and reading error no greater than 67 N (15 lbf).

5.2.4 Loiding Tools

Two loiding tools are required: a knife or spatula with a thin blade [approximately 0.8 mm (1/32 in) thick] and a stiff steel wire with a diameter of about 1.6 mm (1/16 in).

5.2.5 Impactor

The impactor shall be a pendulum system made of steel and capable of delivering horizontal impacts with energies of 50 J (37 ft-lbf). The striking end of the impactor shall have a removable hemispherical nose approximately 32 mm (1 1/4 in) in diameter.

5.3 Sample Preparation

Construct a test wall section as shown in figure 2 and rigidly support it with a wall support fixture as shown in figure 3. Prior to assembling the sliding glass door unit, complete the assembly of each panel, as necessary, and record its weight. Then complete the assembly and install the sliding glass door unit in the test wall in accordance with the manufacturer's instructions.

Perform all tests with the door closed and locked unless otherwise required. Lock both the primary and secondary locks unless the primary lock is designed to be opened with a key from the exterior; in that case, lock only the primary lock.

Replace any component that is broken or damaged during a test with an identical component prior to any subsequent test.

Certain of the test procedures require that tensile loading devices be attached to the sliding glass door units at specified locations. This may be accomplished by any convenient means, such as attaching a bracket at the required location by means of screws or bolts.

CONSTRUCTION NOTES

1. ALL STUDS AND PLATES ARE 2x4's. HEADERS AS APPROPRIATE FOR OPENING.
2. NAIL SOLE PLATE AND LOWER MEMBER OF TOP PLATE TO EACH STUD WITH 2 - 16d END NAILS.
3. NAIL UPPER OF TOP PLATE TO THE LOWER MEMBER WITH 16d NAILS, ONE NAIL NEAR EACH STUD AND 2 NEAR EACH END.
4. NAIL THE DOUBLE STUDS TOGETHER WITH 16d NAILS NOT MORE THAN 61cm (24in) ON CENTERS.
5. NAIL THE HEADER TO EACH FULL LENGTH STUD WITH 4 - 16d END NAILS.
6. ON THE DESIGNATED EXTERIOR NAIL 1/2 INCH PLYWOOD SHEATHING TO PLATES AND STUDS WITH 6d NAILS 15cm (6in) ON CENTERS AROUND THE PERIMETERS AND 30cm (12in) ON CENTERS ALONG INTERMEDIATE SUPPORTS.
7. ON THE DESIGNATED INTERIOR NAIL 1/2 INCH GYPSUM DRYWALL TO ALL SUPPORTS WITH THREADED DRYWALL NAILS 20cm (8in) ON CENTERS.

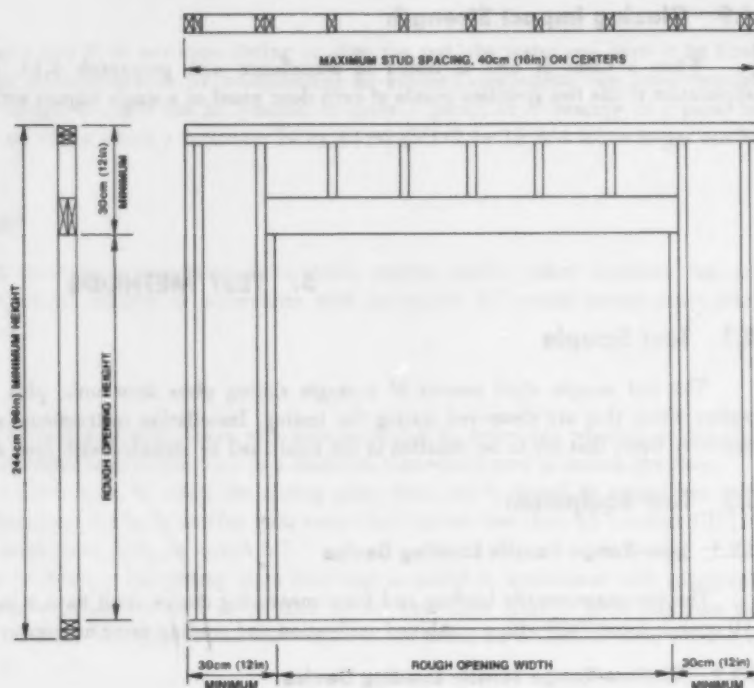
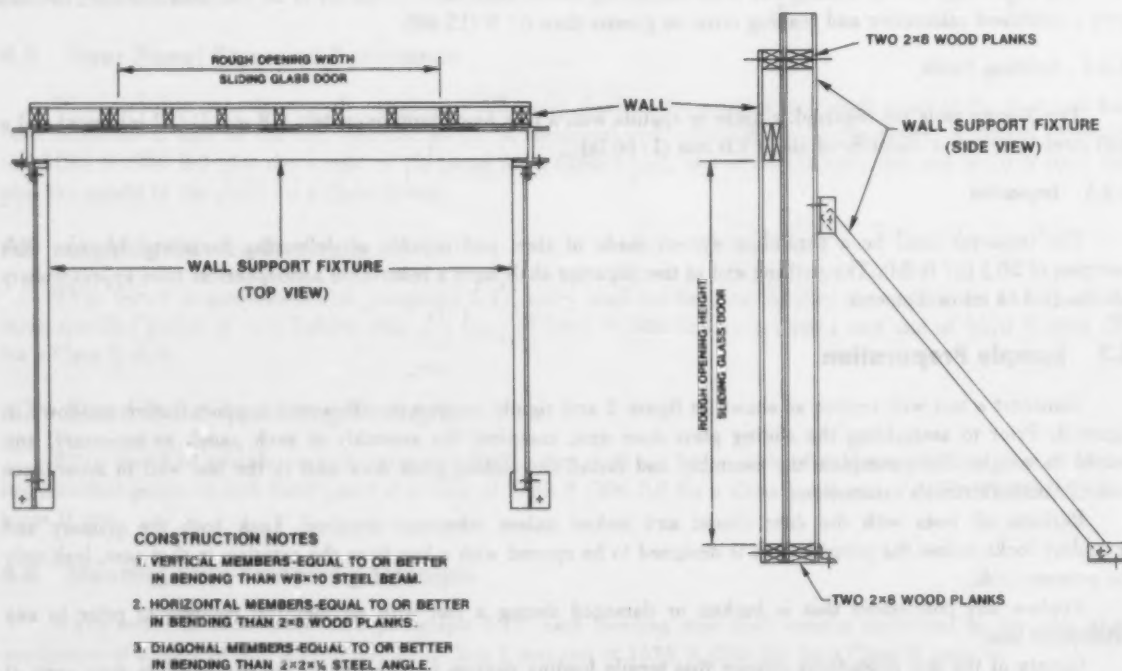


FIGURE 2. Wall for sliding glass door tests.



CONSTRUCTION NOTES

1. VERTICAL MEMBERS-EQUAL TO OR BETTER IN BENDING THAN W8x10 STEEL BEAM.
2. HORIZONTAL MEMBERS-EQUAL TO OR BETTER IN BENDING THAN 2x8 WOOD PLANKS.
3. DIAGONAL MEMBERS-EQUAL TO OR BETTER IN BENDING THAN 2x2x1/4 STEEL ANGLE.

FIGURE 3. Wall support fixture for sliding glass door tests.

5.4 Test Sequence

Perform the tests in the same order as the tests are presented below. Note that all test forces are static tensile forces unless specifically stated otherwise.

5.5 Disassembly Test

Remove all screws and other fastening and assembly devices that can be removed from the exterior side of the door unit by means of commonly available tools such as knives, Allen wrenches and conventional and Phillips screw drivers with blades no longer than 15 cm (6 in). After removal of the fastening and assembly devices, determine whether it is possible to gain entry by using the same tools or by hand forcing.

5.6 Loiding Test

By actual trial, determine whether it is possible to insert each of the two loiding tools (par. 5.2.4) from the exterior side of the door unit and to manipulate it so as to exert pressure on the latch operator or directly on the latch in a direction that would tend to unlock the door.

5.7 Latch Operator Loiding Force Test

Attach the low-range tensile loading device (par. 5.2.1) to the midpoint of the latch operator handle by means of a wire. Exert a force of 45 N (10 lbf) on the handle in the direction which would tend to unlock the door unit. Observe whether this force moves the latch operator to the unlocked position.

5.8 Latch Loiding Force Test

Adjust the operative panel to its lowest position within the unit. Then adjust the primary locking device so that the operative panel can be locked, and lock it. Apply the required force vertically to the locking stile of the operative panel so as to tend to lift it. Observe whether the latch moves to the unlocked position. Following this test, readjust the operative panel and the primary locking device to their normal positions.

5.9 Locking Device Stability Test

Apply a horizontal force of 222 N (50 lbf) to the locking stile of each operative panel at midheight in the direction that will tend to move the panel in its intended opening direction. With the horizontal force still applied, apply a vertical force to the same panel of 222 N (50 lbf) plus the weight of the panel, first to the lower right corner, and then to the lower left corner. Following each application of the vertical force return the operative panel to its original position. Repeat this test nine times for a total of ten tests, or until the locking device is unlocked.

5.10 Door Panel Removal Test

Simultaneously apply the required horizontal and vertical tensile forces to the bottom rail of each door panel, in succession, at each of two locations: first to the lower right corner of the panel, and then to the lower left corner. Apply the horizontal force in the direction that would tend to move an interior panel toward the interior and an exterior panel toward the exterior. Apply the vertical force so as to tend to lift the panel.

5.11 Locking Device Strength Test

Apply the required force to the locking stile of each operative panel horizontally in the intended opening direction at each of three positions: first within 10 cm (4 in) of the primary locking device, then within 10 cm (4 in) of the bottom of the panel, and then within 10 cm (4 in) of the top of the panel.

5.12 Fixed Panel Fastening Strength Test

Apply the required force to the fixed stile of each fixed panel horizontally in the direction that is opposite to the intended opening direction of the companion operative panel at each of two positions: first within 10 cm (4 in) of the bottom of the panel, and then at the midheight of the panel.

Apply the required force to each exterior meeting stile at midheight horizontally in the direction that is parallel to the glazing and that tends to separate the stile from the glazing. Entry shall be assumed to have been made if either end of the stile is pulled from its connecting rail.

5.14 Glazing Impact Strength Test

Position the impactor in front of the exterior side of the sliding glass door unit so that, at rest, its major axis is perpendicular to the glazing and its striking end is just touching the surface of the glazing. Deliver the required impact to the glazing of each door panel at each of the following points: 1) to the bottom corner of each panel at a point 10 cm (4 in) from both the locking stile and the bottom rail, and 2) to a point at the geometric center of each panel glazing. Calculate the impact energy from the weight of the impactor and the drop height.

APPENDIX A—TEST EQUIPMENT

Test equipment suitable for use in evaluating the physical security of sliding glass door units is described below. However, any equipment that meets the requirements of paragraph 5.2 would be acceptable.

1. Low-Range Tensile Loading Device

The low-range tensile loading and force measuring device used was a surveyor's spring balance system as shown in figure A-1. A large handle was attached to the case for convenience in use. The spring balance had a load capacity of 133 newtons (N) [30 pounds-force (lbf)].



FIGURE A-1. Low-range tensile loading device.

2. Medium-Range Tensile Loading Device

The medium-range tensile loading and force measuring device consisted of a spring balance with a capacity of 667 N (150 lbf), a cable and a turnbuckle for applying tension. A typical arrangement for using this device is shown in figure A-2.

3. High-Range Tensile Loading Device

The high-range tensile loading and force measurement device consisted of a calibrated universal strain-gauge type of load cell with a capacity of 4450 N (1000 lbf) attached to a cable-turnbuckle arrangement. Figure A-2 indicates the method of using this equipment. The force imposed on the specimen was measured with a conventional strain-gauge readout instrument wired to the load cell.

4. Impactor

A sketch of the impactor system is shown in figure A-3. The pendulum ram had a diameter of 5.6 cm (2 3/16 in), a length of 83.8 cm (33 in) and a weight of 16 kg (35.3 lb). The impact nose was made from a 1/4 inch carriage bolt with the square shank removed. The height-of-drop for the pendulum ram to produce an impact of 50 joules (37 ft-lbf) was 31.9 cm (1.05 ft).

In use, it was convenient to suspend the pendulum system from the forks of a fork-lift truck. This enabled rapid horizontal and vertical adjustment of the impact point of the impactor.

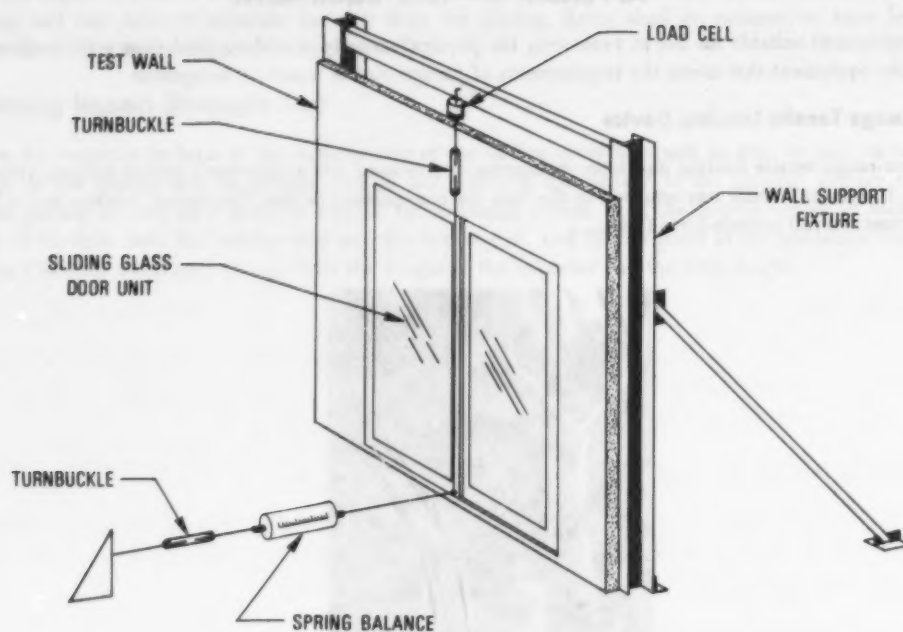


FIGURE A-2. Schematic of test arrangement showing method of using medium-range and high-range tensile loading devices.

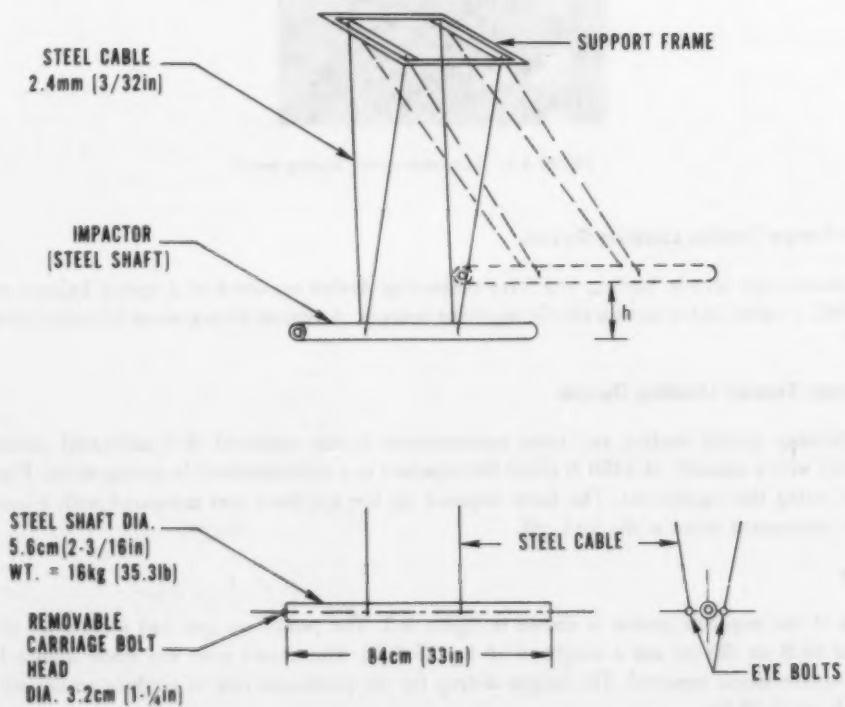
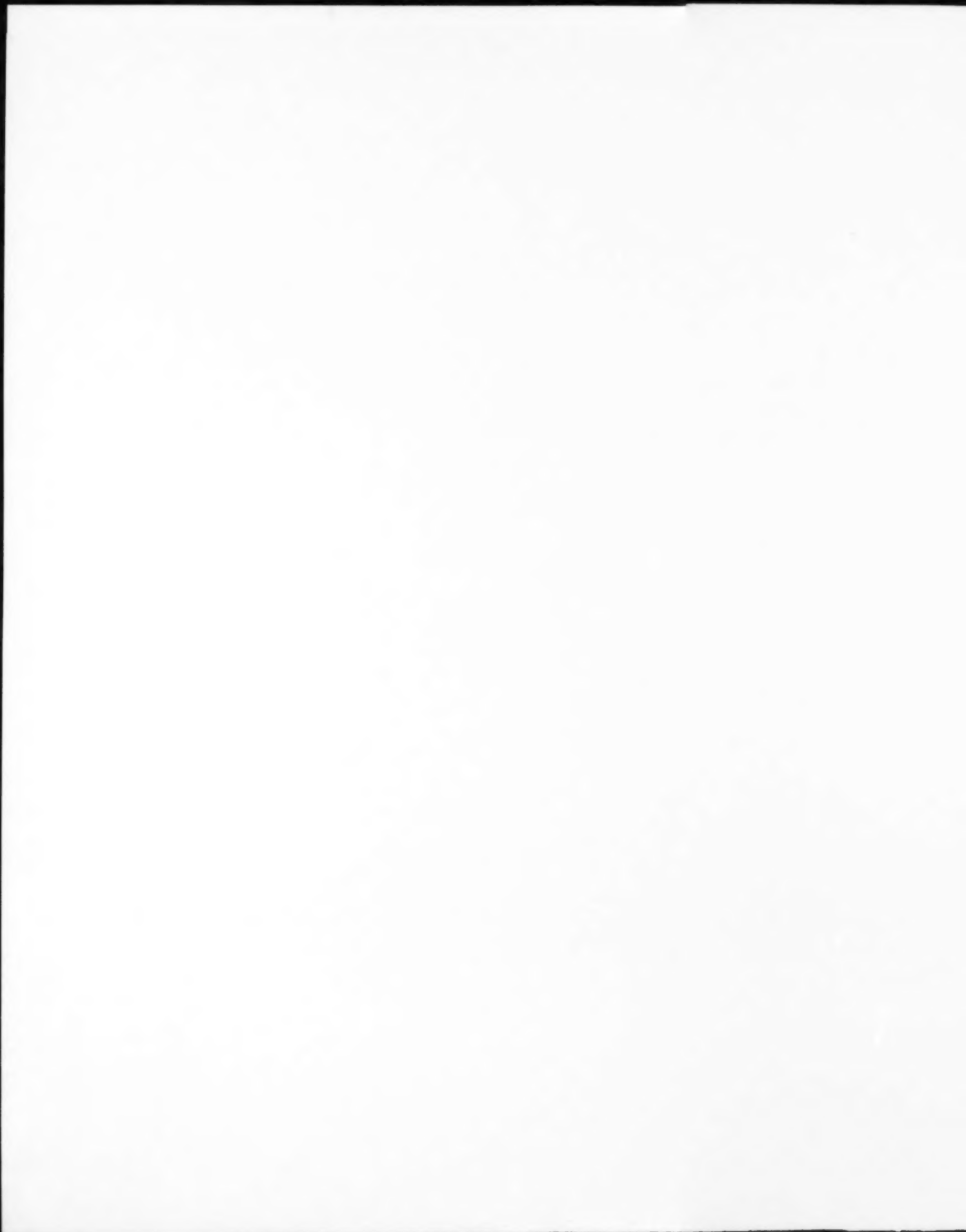


FIGURE A-3. Impactor.





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